Basic Principles of Chemistry

Answer the following questions using the attached information sheets and your class notes.

1. Identify the atomic no. for the following elements:

Hydrogen (H)	____	Oxygen (O)	____
Sodium (Na)	____	Chlorine (Cl)	____
Magnesium (Mg)	____	Nitrogen (N)	____
Potassium (K)	____	Carbon (C)	____
Calcium (Ca)	____	Aluminum (Al)	____
Iron (Fe)	____	Phosphorous (P)	____
Copper (Cu)	____	Sulfur (S)	____
Zinc (Zn)	____	Silica (Si)	____

What does the atomic no. represent or equal to?

2. What is the most common atomic weight for each of the following elements? (ROUND OFF TO THE NEAREST WHOLE NUMBER).

Hydrogen (H)	____	Oxygen (O)	____	Potassium (K)	____	Carbon (C)	____
Sodium (Na)	____	Chlorine (Cl)	____	Magnesium (Mg)	____	Nitrogen (N)	____
Calcium (Ca)	____	Aluminum (Al)	____	Iron (Fe)	____	Phosphorous (P)	____
Copper (Cu)	____	Sulfur (S)	____	Zinc (Zn)	____	Silica (Si)	____

3. What is the number of electrons found associated with each of the following elements?

Hydrogen (H)	____	Oxygen (O)	____
Sodium (Na)	____	Chlorine (Cl)	____
Magnesium (Mg)	____	Nitrogen (N)	____
Potassium (K)	____	Carbon (C)	____
Calcium (Ca)	____	Aluminum (Al)	____
Iron (Fe)	____	Phosphorous (P)	____
Copper (Cu)	____	Sulfur (S)	____
Zinc (Zn)	____	Silica (Si)	____

4. What is the most common number of neutrons found in the nucleus of each of the following elements?

Hydrogen (H)	____	Oxygen (O)	____
Sodium (Na)	____	Chlorine (Cl)	____
Magnesium (Mg)	____	Nitrogen (N)	____
Potassium (K)	____	Carbon (C)	____
Calcium (Ca)	____	Aluminum (Al)	____
Iron (Fe)	____	Phosphorous (P)	____
Copper (Cu)	____	Sulfur (S)	____
Zinc (Zn)	____	Silica (Si)	____

5. Name and define the two principal types of atomic bonding?

6. Which particle of the atom defines the type of element that it represents?

7. Oxygen 18 and Oxygen 16 are examples of two _____ of oxygen. By definition, each has the same number of _____, but a different number of _____.

8 How many electrons does the first electron energy level shell hold? _____
How many electrons does each successive electron shell hold? _____.

9. What are the "noble gases" and what is unique about their electron configurations?

10. Write the scientific (exponential) notation for the following numbers

2 billion	_____	100	_____
1,000,000	_____	0.00001	_____
0.0015	_____	10,000	_____

11. Make the following English and Metric Conversions:

Convert 8.9 km to meters:
Convert 25 cm to millimeters:
Convert 8.9 km to miles:
Convert 2000 Ft to inches:
Convert 6.3 miles to Feet:
Convert 76 degrees Farenheit to Centigrade:
Convert 10 degrees C to Kelvin:
Convert 10 degrees Centigrade to Farenheit:

TABLE 9-6
The Periodic Table of the Elements.

Group	I	II											III	IV	V	VI	VII	VIII
Period 1	1.008 H 1																	4.00 He 2
2	6.94 Li 3	9.01 Be 4											10.81 B 5	12.01 C 6	14.01 N 7	16.00 O 8	19.00 F 9	20.18 Ne 10
3	22.99 Na 11	24.31 Mg 12											26.98 Al 13	28.09 Si 14	30.97 P 15	32.06 S 16	35.45 Cl 17	39.95 Ar 18
4	39.10 K 19	40.08 Ca 20	44.96 Sc 21	47.90 Ti 22	50.94 V 23	52.00 Cr 24	54.94 Mn 25	55.85 Fe 26	58.93 Co 27	58.70 Ni 28	63.55 Cu 29	65.38 Zn 30	69.72 Ga 31	72.59 Ge 32	74.92 As 33	78.96 Se 34	79.90 Br 35	83.8 Kr 36
5	85.47 Rb 37	87.62 Sr 38	88.91 Y 39	91.22 Zr 40	92.91 Nb 41	95.94 Mo 42	(97) Tc 43	101.1 Ru 44	102.9 Rh 45	106.4 Pd 46	107.9 Ag 47	112.4 Cd 48	114.8 In 49	118.7 Sn 50	121.8 Sb 51	127.6 Te 52	126.9 I 53	131.3 Xe 54
6	132.9 Cs 55	137.3 Ba 56	* 57–71	178.5 Hf 72	180.9 Ta 73	183.9 W 74	186.2 Re 75	190.2 Os 76	192.2 Ir 77	195.1 Pt 78	197.0 Au 79	200.6 Hg 80	204.4 Tl 81	207.2 Pb 82	209.0 Bi 83	(209) Po 84	(210) At 85	(222) Rn 86
7	(223) Fr 87	226.0 Ra 88	† 89–103															*Halogens Inert gases*
	Alkali metals																	
	*Rare earths			138.91 La 57	140.12 Ce 58	140.91 Pr 59	144.24 Nd 60	(145) Pm 61	150.4 Sm 62	152.0 Eu 63	157.3 Gd 64	158.9 Tb 65	162.5 Dy 66	164.9 Ho 67	167.3 Er 68	168.9 Tm 69	173.0 Yb 70	175.0 Lu 71	
	†Actinides			(227) Ac 89	232.0 Th 90	231.0 Pa 91	238.0 U 92	(237) Np 93	(244) Pu 94	(243) Am 95	(247) Cm 96	(247) Bk 97	(251) Cf 98	(254) Es 99	(257) Fm 100	(258) Md 101	(255) No 102	(260) Lr 103	(257) Rf 104	(260) Ha 105

The number above the symbol of each element is its atomic mass, and the number below the symbol is its atomic number. The elements whose atomic masses are given in parentheses do not occur in nature, but have been prepared artificially in nuclear reactions. The atomic mass in such a case is the mass number of the most long-lived radioactive isotope of the element.

Elements created in the laboratory

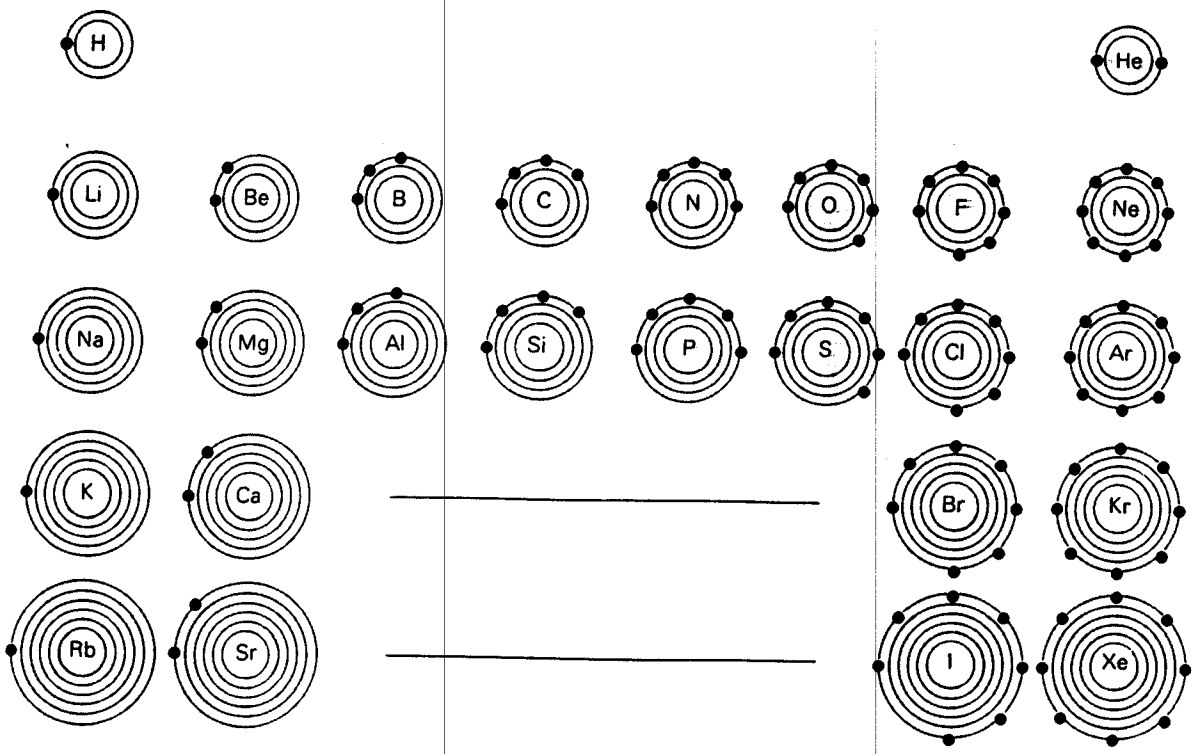

FIG. 9-11
Electron structures of some atoms. In this schematic representation of Table 9-7 the electrons in filled inner shells are not shown.

TABLE 9-7
Simplified Table of Electron Structures of Some Atoms.
(Subshells are filled when a shell has 2, 8, or 18 electrons.)

Electrons in	H							He
1st shell	1							2
Electrons in	Li	Be	B	C	N	O	F	Ne
1st shell	2	2	2	2	2	2	2	2
2d shell	1	2	3	4	5	6	7	8
Electrons in	Na	Mg	Al	Si	P	S	Cl	Ar
1st shell	2	2	2	2	2	2	2	2
2d shell	8	8	8	8	8	8	8	8
3d shell	1	2	3	4	5	6	7	8
Electrons in	K	Ca	.....				Br	Kr
1st shell	2	2					2	2
2d shell	8	8					8	8
3d shell	8	8					18	18
4th shell	1	2					7	8
Electrons in	Rb	Sr	.....				1	Xe
1st shell	2	2					2	2
2d shell	8	8					8	8
3d shell	18	18					18	18
4th shell	8	8					18	18
5th shell	1	2					7	8

ISOTOPES

Table 23 MASSES OF SOME NUCLIDES

Element	*Symbol*	*Atomic mass** (u)**	*Element*	*Symbol*	*Atomic mass** (u)**
hydrogen	$^{1}_{1}H$	1.007825	sodium	$^{23}_{11}Na$	22.98977
deuterium	$^{2}_{1}H$	2.01410	magnesium	$^{24}_{12}Mg$	23.98504
helium	$^{3}_{2}He$	3.01603		$^{25}_{12}Mg$	24.98584
	$^{4}_{2}He$	4.00260		$^{26}_{12}Mg$	25.98259
lithium	$^{6}_{3}Li$	6.01513	chlorine	$^{35}_{17}Cl$	34.96885
	$^{7}_{3}Li$	7.01601		$^{37}_{17}Cl$	36.96590
beryllium	$^{6}_{4}Be$	6.0198	potassium	$^{39}_{19}K$	38.96371
	$^{8}_{4}Be$	8.00531		$^{41}_{19}K$	40.96184
	$^{9}_{4}Be$	9.01219	krypton	$^{95}_{36}Kr$	94.9
boron	$^{10}_{5}B$	10.01294	molybdenum	$^{100}_{42}Mo$	99.9076
	$^{11}_{5}B$	11.00931	silver	$^{107}_{47}Ag$	106.9041
carbon	$^{12}_{6}C$	12.00000		$^{109}_{47}Ag$	108.9047
	$^{13}_{6}C$	13.00335	technetium	$^{137}_{52}Te$	137.0000***
nitrogen	$^{12}_{7}N$	12.0188	barium	$^{138}_{56}Ba$	137.9050
	$^{14}_{7}N$	14.00307	lead	$^{214}_{82}Pb$	213.9982
	$^{15}_{7}N$	15.00011	bismuth	$^{214}_{83}Bi$	213.9972
oxygen	$^{16}_{8}O$	15.99491	polonium	$^{218}_{84}Po$	218.0089
	$^{17}_{8}O$	16.99914	radon	$^{222}_{86}Rn$	222.0175
	$^{18}_{8}O$	17.99916	radium	$^{228}_{88}Ra$	228.0303
fluorine	$^{19}_{9}F$	18.99840	uranium	$^{235}_{92}U$	235.0439
neon	$^{20}_{10}Ne$	19.99244		$^{238}_{92}U$	238.0508
	$^{22}_{10}Ne$	21.99138	plutonium	$^{239}_{94}Pu$	239.0522

*Atomic mass of neutral atom is given.
**1 atomic mass unit (u) = 1.66043×10^{-27} kg.
***Mass not accurately known. Maximum possible value is given.

Table 5 CONVERSION FACTORS

LENGTH

1 m = 10^{-3} km = 10^{2} cm = 10^{3} mm = 10^{6} μm = 10^{9} nm = 10^{10} Å
1 μ = 1 μm = 10^{-6} m = 10^{-4} cm = 10^{-3} mm = 10^{3} mμ = 10^{3} nm = 10^{4} Å
1 mμ = 1 nm = 10^{-9} m = 10^{-7} cm = 10^{-6} mm = 10 Å
1 Å = 10^{-10} m = 10^{-8} cm = 10^{-4} μ = 10^{-1} mμ = 10^{-1} nm

AREA

1 m^2 = 10^{-6} km^2 = 10^{4} cm^2 = 10^{6} mm^2

VOLUME

1 m^3 = 10^{-9} km^3 = 10^{3} l = 10^{6} cm^3
1 l = 10^{3} ml = 10^{3} cm^3 = 10^{-3} m^3

ANGULAR

1° = 1.74×10^{-2} radian = 2.78×10^{-3} revolution
1 radian = 57.3° = 1.59×10^{-1} revolution
1 revolution = 360° = 6.28 radians

MASS

1 kg = 10^{3} g = 10^{6} mg = 6.02×10^{26} u
1 g = 10^{-3} kg = 10^{3} mg = 6.02×10^{23} u
1 u = 1.66×10^{-24} g = 1.66×10^{-21} mg = 1.66×10^{-27} kg

TIME

1 hr = 60 min = 3.6×10^{3} sec
1 min = 60 sec = 1.67×10^{-2} hr
1 sec = 1.67×10^{-2} min = 2.78×10^{-4} hr

VELOCITY

1 km/hr = 10^{3} m/hr = 16.7 m/min = 2.78×10^{-1} m/sec
1 m/min = 10^{2} cm/min = 1.67×10^{-2} m/sec = 1.67 cm/sec
1 m/sec = 10^{-3} km/sec = 3.6 km/hr = 10^{2} cm/sec

ACCELERATION

1 cm/sec^2 = 10^{-2} m/sec^2 = 10^{-5} km/sec^2
1 m/sec^2 = 10^{2} cm/sec^2 = 10^{-3} km/sec^2
1 km/hr/sec = 10^{3} m/hr/sec = 2.78×10^{-1} m/sec^2 = 2.78×10^{1} cm/sec^2 = 2.78×10^{2} mm/sec^2

FORCE

1 n = 10^{5} dynes
1 dyne = 10^{-5} n

PRESSURE

1 atm = 760.00 mm Hg = 1.013×10^{5} n/m^2 = 1.013×10^{6} $dynes/cm^2$
1 n/m^2 = 10 $dynes/cm^2$ = 9.87×10^{-6} atm

ENERGY

1 j = 10^{7} ergs = 2.39×10^{-1} cal = 2.39×10^{-4} kcal = 2.78×10^{-7} kw hr = 6.25×10^{18} ev
1 cal = 10^{-3} kcal = 4.19 j = 1.16×10^{-6} kw hr
1 kcal = 10^{3} cal = 4.19×10^{3} j = 1.16×10^{-3} kw hr
1 ev = 10^{-6} Mev = 1.60×10^{-12} erg = 1.60×10^{-19} j
1 kw hr = 10^{3} w hr = 3.6×10^{3} kw sec = 3.6×10^{6} w sec = 8.6×10^{5} cal
1 w sec = 2.78×10^{-4} w hr = 2.78×10^{-7} kw hr

MASS-ENERGY

1 j = 1.11×10^{-17} kg = 1.11×10^{-14} g = 6.69×10^{9} u
1 ev = 1.07×10^{-9} u = 1.78×10^{-33} g
1 u = 1.49×10^{-3} erg = 1.49×10^{-10} j = 931 Mev = 9.31×10^{8} ev
1 kg = 9.00×10^{16} j = 9.00×10^{23} ergs